

REMARKS

Claims 1-17 are pending. Claims 1 and 11 have been amended to clarify that the vinyl-urethane copolymer has at least one segment wherein the linkage segment having a silicon-oxygen bond is bonded to both the urethane polymer chain and the vinyl polymer chain. Support for new claim 17 appears on page 130, line 20 to page 131, line 19, example 1-18, and claim 11-16 and the like. No new matter has been added by way of the above-amendment.

The following sections correspond to the sections of the outstanding Office Action.

Prior Art Based Issues

The following Rejections (A)-(D) are pending:

- A) Claims 1 and 3 are rejected under 35 U.S.C. 102 (b) as being anticipated by Lai, "Novel Polyurethane-Silicone Hydrogels" Journal of Applied Polymer Science 56, 301-310 (1995);
- B) Claims 1-10 are rejected under 35 U.S.C. 102 (b) as being anticipated by WO/03018658 to Schindler et al. (the Examiner relies on US 2004/0204539 as an English equivalent);
- C) Claims 11-14 and 16 are rejected under 35 U.S.C. 103 (a) as being unpatentable over WO/03018658 to Schindler et al. in view of U.S. Patent No. 6,031,041 to Chung et al.; and
- D) Claim 15 are rejected under 35 U.S.C. 103 (a) as being unpatentable over WO/03018658 to Schindler et al. in view of U.S. Patent No. 6,031,041 to Chung et al. and further in view of U.S. Patent No. 5,854,332 to Swarup et al.

Applicants respectfully traverse the rejections.

(1) Present invention

The present invention relates to "a vinyl-urethane copolymer comprising at least one vinyl polymer chain and at least one urethane polymer chain, the vinyl polymer chain being combined with the urethane polymer chain through the intermediary of a linkage segment having a silicon-oxygen bond" (claim 1). The basic structure of vinyl-urethane copolymer of the present invention has the triad structure consisted of at least one vinyl polymer chain, at least one urethane polymer chain and a linkage segment. The polymer is referred to as vinyl-urethane terpolymer. Vinyl-urethane copolymers in the present invention are classified as vinyl-urethane bipolymers and vinyl-urethane terpolymers according to whether the Si-O bond-containing linkage segment is a low-molecular-weight Si-O bond-containing linkage segment or a high-molecular-weight Si-O bond-containing linkage segment. This classification, however, is conducted only for the sake of convenience. Specifically, there is the case where no significant difference can be found between some vinyl-urethane bipolymers and some vinyl-urethane terpolymers, and in this case, the copolymers can be classified as one of the two categories as appropriate or can be classified as belonging to the two categories (page 18, line 20 - page 19, line 10).

The urethane polymer chains in the vinyl-urethane copolymers are not specifically limited, as long as they are polymer chains comprising polymers having a urethane bond. Such polymers preferably have a urethane bond in their principal chain or skeleton (page 19, lines 10 - 14).

The vinyl polymer chains in the vinyl-urethane copolymers are not specifically limited, as long as they are polymer chains comprising polymers derived from a vinyl-containing monomer component (page 19, lines 22 - 25).

In addition, "Polyurethane chains (X1)" described in the example of the present application is characterized by being an aqueous dispersion containing hydrophilic groups.

Applicants respectfully submit that the claimed invention is neither anticipated nor rendered obvious by the cited references, since the cited references do not teach the structural features of the inventive vinyl-urethane copolymer. Applicants now turn to the teachings of the cited references.

(2) Lai

The present application is rejected as being anticipated by a cited document Lai, "Novel Polyurethane-Silicone Hydrogels" Journal of Applied Polymer Science, 56, 301-310 (1995) in outstanding office action.

Although the Examiner asserted that Lai describes the vinyl-urethane copolymer according to the present invention, the compound described in Lai is quite different from, and does not meet the definition of, the vinyl-urethane copolymer according to the present invention.

The vinyl-urethane copolymer according to the present invention is a terpolymer having the triad structure comprising at least one vinyl polymer chain, at least one urethane polymer chain and a linkage segment.

The compound disclosed in Lai is a UV-curable compound. It is suggested that the vinyl binding site in the compound shown in the chemical formula is polymerized by UV, and cures. Applicants guess that presumably the Examiner selected the document as a cited reference since the Examiner considered that the compound becomes a polymer comprising each of "Polyurethane chain", "Polyvinyl chain" and "Silicone chain" when the compound is polymerized, and cures.

Indeed, when the compound disclosed in Lai is polymerized, it seems that a polymer having each of three kinds of elements of the present invention may be produced. However, the polymer above is quite different from the polymer defined in claim 1 of the present invention in that the order of binding of each elements is different between in Lai and in the present invention.

In page 3 of the outstanding Office Action, the Examiner cites to the chemical formula of the compound of Lai (Lai, page 302, right column). Indeed, the compound is considered as a polymer having each of three kinds of elements of the present invention - "Polyurethane chain", "Polyvinyl chain" and "Silicone chain". In the outstanding Office Action, the Examiner pointed the existence of the urethane part, the silicon-oxygen part and the vinyl part in the formula with the arrow.

However, this compound of Lai (cited by the Examiner) is not a vinyl-urethane terpolymer according to claim 1 of the present invention in that the order of binding of each elements in Lai is different from that of the present invention. For clarification, the Examiner's attention is directed to Figure 1 which is attached hereto as an Appendix.

The Examiner will note that the compound of Lai is merely a compound in which urethane chain having an acrylic acid (vinyl part) at the terminal is linked through silicon-oxygen bond. In other words, two polyurethane chains are linked through a silicone chain. Therefore, the compound described in Lai is not the compound "a vinyl-urethane copolymer comprising at least one vinyl polymer chain and at least one urethane polymer chain, the vinyl polymer chain being combined with the urethane polymer chain through the intermediary of a linkage segment having a silicon-oxygen bond" described in claim 1 of the present invention.

It appears that this situation can be expressed as seen in the attached figure 1. Please note that "V" in the figure means an unit derived from a vinyl group, "PV" is a polyvinyl chain, "PU" is a polyurethane chain and "PS" is a silicone chain (corresponding to R" in the figure of Lai). That is, "polyvinyl chain" and "silicone chain" are linked with "polyurethane chain" in the polymer compound disclosed in Lai. In a word, "polyvinyl chain" and "polyurethane chain" are linked directly to each other.

On the other hand, in the copolymer of the present invention "Polyurethane chain" and "Polyvinyl chain" do not directly link together and always link together via silicone chain because the both "Polyurethane chain" and "Polyvinyl chain" carry the hydrolyzable silyl groups. Therefore, the copolymer of the present invention is structurally distinguishable from Lai's copolymer.

According to MPEP 2131, "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." In view of the fact that Lai fails to teach or fairly suggest the structure of the inventive copolymer, a *prima facie* case of anticipation cannot be said to exist. As such, withdrawal of Rejection (A) is respectfully requested.

(3) Schindler

As noted in Rejection (B) above, claims 1-10 are rejected as being anticipated by WO/03018658 to Schindler et al. in outstanding Office Action.

Although the Examiner asserted that Schindler et al. describe the vinyl-urethane copolymer according to the present invention, the compound described in Schindler et al. is quite different from, and does not meet the definition of, the vinyl-urethane copolymer according to the present invention.

The technology of the disclosure of Schindler et al. relates to rapid-cure polymer mixtures, containing alkoxy silane-terminated polymers. The Examiner asserts that the reference describes the vinyl-urethane copolymer according to the present invention in Examples 7 and 8 of the reference. However, upon review of the processes of Examples 7 and 8, Applicants respectfully submit that the structure of the product copolymer does not meet the structural requirement of inventive claim 1.

Examples 7 and 8 of the reference recite the following steps:

- (1) polypropylene glycol is polymerized with isophorone diisocyanate;
- (2) admixed with isocyanatomethyl-trimethoxysilane to give a silane-terminated polymer; and
- (3) the silane-terminated polymer is admixed with diisoundecyl phthalate, 3-(2-aminoethyl)aminopropyl-trimethoxysilane, vinyltrimethoxysilane, and is dried as a chalk.

As mentioned above, the vinyl-urethane copolymer according to the present invention is a terpolymer having the triad structure comprising at least one vinyl polymer chain, at least one urethane polymer chain and a linkage segment. Applicants respectfully submit that it is impossible to synthesize the inventive terpolymer having the triad structure from the above-mentioned description of (1)-(3).

Indeed, the existence of the polyurethane chain and the silicone chain is confirmed in steps (1) and (2). However, there is no polyvinyl chain formed in the subsequent step (3) which links to the silane-terminated polymer. Perhaps, the polyurethane chain will be obtained which is alkoxy silylated with 3-(2-aminoethyl)-aminopropyl trimethoxysilane, vinyl trimethoxysilane

and the like. Moreover, it may be that further polymerization with vinyl monomer will result in polyvinyl, however, Schindler is silent about the possibility. Therefore, Applicants believe that polymer described in Schindler is clearly distinguishable from terpolymer having the triad structure consisted of "vinyl polymer chain" and the "urethane polymer chain" having an intermediary "linkage segment having a silicon-oxygen bond."

In addition, the present invention and the invention described in Schindler et al. have distinct processes. The curable compound in which vinyl silane is combined with the silyl group-terminated urethane polymer is described in Example 8 of Schindler et al. as mentioned above. However, the procedure of Schindler et al. does not polymerize the combined vinylsilane intentionally and actively. Generally, as those skilled in the art recognize, vinylsilane is added as "Dehydrating agent" to absorb the small amount of water that exists in the fraction of the moisture curing silyl group terminated polymer. Moreover, Schindler et al. disclose a curable resin composition that cures rapidly by moisture in the air. On the other hand, it is clear that the polymer of the present invention differs fundamentally from the curable resin composition according to Schindler et al. which is unfavorable to hygroscopic moisture because the polymer of the present invention is basically an "aqueous dispersion".

Therefore, Applicants respectfully submit that the compound described in Schindler et al. is not the one described in claim 1. In view of the fact that the compound of Schindler et al. fail to teach or suggest the structural features of the inventive copolymer, a *prima facie* case of anticipation cannot be said to exist. As such, withdrawal of Rejection (B) is respectfully requested.

(4) Combination of Schindler et al., Chung et al. and optionally Swarup et al.

As mentioned in Rejection (C) above, claims 11-14 and 16 are rejected over the combination of Schindler et al. and Chung et al. Also, in Rejection (D), claim 15 is rejected over the combination of Schindler et al., Chung et al. and Swarup et al.

Claims 11-16 relate to methods for producing a vinyl-urethane copolymer according to the present invention. The Examiner asserts that the artisan would readily combine Schindler et al. and Chung et al. to complete the invention described in claim 11-16 of the present invention

because Schindler et al. disclose the vinyl-urethane copolymer as described in claim 1 of the present invention and Chung et al. discloses a method wherein a silylated vinyl monomer is polymerized in the presence of an aqueous polyurethane dispersion.

Applicants note that Chung et al. describe a polyurethane hybrid dispersion in which vinyl monomer which may contain silyl groups is polymerized in an aqueous polyurethane dispersion. However, even if the polyvinyl chain has a hydrolyzable silyl group, there is *no reactive point* between the silyl group of the polyvinyl chain and the aqueous polyurethane dispersion because the aqueous polyurethane dispersion according to Chung et al. has no hydrolyzable silyl group. As a result, in the aqueous polyurethane dispersion, two different kinds of polymers exist in a mixed (i.e., unreacted) state, and remain unpolymerized.

Furthermore, although the Examiner asserts that the artisan would readily combine the teachings of Chung et al. with Schindler et al., the curable resin composition according to Schindler et al. requires avoidance of hygroscopic moisture (it will be rapidly cured by hygroscopic moisture). Therefore, it is impossible for those skilled in the art to consider combining the contradictory conditions of Chung et al. and Schindler et al., preparing such an aqueous dispersion and performing a vinyl polymerization.

Moreover, as discussed above, the copolymer described in Schindler et al. is quite different from the copolymer according to the present invention. Therefore, even if Schindler et al. and Chung et al. are combined, one would not obtain the invention of claim 11-16 according to the present invention. Furthermore, the teachings of Swarup et al. fail to cure the deficiencies of Chung et al. and Schindler et al. As such, reconsideration and withdrawal of Rejections (C) and (D) are respectfully requested.

CONCLUSION

In view of the above remarks, it is believed that claims are allowable.


Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly solicited.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Garth M. Dahlen, Ph.D., Esq. (Reg. No. 43,575) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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Attached: Figure 1 showing distinction between Lai and the Present Invention